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FOREST VEGETATION OF OZAUKEE COUNTY

Ozaukee County, although the smallest in Wisconsin, contains several areas of vegetation in near pre-settlement condition and exhibits diversity both in native vegetation and in the culturally dictated land uses.

Agricultural enterprises, primarily crop and dairy farms, have replaced the upland forest which once covered approximately 94% of the county. Those land uses in recent years are being replaced, especially in the southern portion of the county, by urban development from the Milwaukee metropolitan region. Today, only 11% of the original forest remains, and this consists largely of lowland hardwood and conifer stands (USDA 1970).

The county owes its vegetational diversity to the proximity of Lake Michigan. The lake modifies the temperatures near the shoreline permitting a narrow southward extension of the northern dry-mesic forest. The Cary and Valders substages of the Wisconsin glaciation left north-south moraines and patches of kettle topography which control the drainage pattern and result in many areas of poorly drained wetland. The great diversity of glacial materials ranging from clay to gravel, and the level to mildly rolling topography also contribute.

In 1976, I undertook to map the original vegetation of Ozaukee County as shown by the original land survey records and to locate and describe the areas of native vegetation which still exist in the county (Brumm 1977). In the process of this survey, 179 areas were evaluated of which 98 were of reasonable to good natural area quality. Some of the better forest stands were sampled in 1976 and 1977 utilizing the quarter-point method (Cottam and Curtis 1956). Data from five sites sampled by Dunnam (1972) and Levenson (1976) provided additional information. Of the stands sampled, five represent lowland forest, two are northern dry-mesic forest along the shore of Lake Michigan and the remaining

12 are upland hardwood forests ranging in composition from beech-maple to oak-maple. Percentage frequency, percentage density and percentage dominance (based on total basal area by species) were determined for each tree species in these 19 stands and importance values were calculated. Composition of the several stands as indicated by importance value shows that the remaining forest vegetation on the uplands represents a continuum from southern dry mesic through mesic to northern dry-mesic while the lowland stands are discrete but show some overlap in species composition (Table 1).

The stands differ in age and amount of disturbance. Those stands which appeared most similar to the southern mesic regional forest show considerable species richness. Data were aggregated separately for upland stands and lowland stands and composition was compared with the forest composition as determined from the surveyor's notes on witness trees at section and quarter section corners. Present stand composition appears to resemble closely that of the original vegetation (Tables 2,3) (Brumm 1977). However, in the lowland forest, black ash appears to be less important than it was in the time of the land survey in 1833-1835 and its place has been taken largely by yellow birch and red and silver maple. Change in the lowland forest has been compounded by Dutch elm disease which in recent years has almost eliminated American elm.

The upland forests are similar in composition to those recorded by the land surveyors. Dominant species were and are beech, sugar maple, basswood, and oak (Tables 2, 3). Today, beech appears to be less important and upland elm has been virtually eliminated in all but the small size classes. Elm was replaced mostly by sugar maple and white ash. Upland stands that remain are relatively small and are subject to considerable disturbance from logging and grazing as well as from recreational activity.

Thirty-three tree species were recorded in the 19 stands sampled. The greatest number of individual species were found in the two northern mesic stands at Donges Bay and Fairy Chasm (14 and 15), while the smallest number of species were found in the Buckskin Bowmen upland forest (4) and the Blueberry lowland forest (4). The UWM Field Station stand included 13 species, the greatest number in any upland beech-maple stand.

Disturbance is an important factor relating to species richness and to the ability of the stand to maintain itself. Natural disturbances are recurring events as typified by the ice storm of March 1976 and the occasional tornadic wind as well as by drought which influences the upland stands and flooding, drought or insect attack which influence the lowland stands (Grittinger, 1969).

Human disturbance is also a major factor and formerly involved grazing, selective cutting for firewood or lumber and fire. The introduction of Dutch elm disease from Europe altered several of the stands irrevocably, eliminating American and slippery elm which in earlier times had been major components.

The greatest threat to the persistence of the regional, i.e., beech-maple, forest in Ozaukee County is the increasing fragmentation of the remaining stands, their reduction in size and alteration in shape compounded by increased isolation of stands. All of these factors preclude transport of propagules. Beech, which seeds rarely in this area, is reproducing only where beech is now present

and reproduction is primarily root sprouts and suckers. We may anticipate that in time beech will become a minor component of these stands and that with greater destruction of the forest canopy, ash, basswood and perhaps hickory will increase in dominance.

Fortunately Ozaukee County contains many wetlands, their borders support individuals or small stands of upland mesic forest species. These areas provide refuge for such species and sources of seed in the event that some suitable site becomes available.

A final outcome of the study reported here, included identification of all natural areas, upland and lowland. Examination of the surveyors records led to a map of the original vegetation for the county. Details of the natural areas survey and of the original vegetation as derived from the surveyors records will be published elsewhere.

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TABLE 1 – Ozaukee County Forest Stands

Stand Type	Location	Number and Name	Dominant Species	Investigator
Northern wet to wet-mesic	T12N R21E Sec 10, 11, 22	#16 Cedar Valley Road Lowland	black ash tamarack white cedar	Brumm July 1977
Northern wet to wet-mesic	T12N R21E Sec 8, 9, 22, 21	#17 Huiras Lake Lowland	white cedar yellow birch red-silver maple tamarack	Brumm September 1976
Northern wet-mesic	T11N R21E Sec 3	#59 Blueberry Road woodlot lowlands	yellow birch white cedar black ash	Brumm August 1976
Southern wet to wet-mesic	T10N R22E Sec 4, 8, 9	#130 Ulao Lowland Forest	red-silver maple black ash yellow birch	Brumm July 1977
Southern wet-mesic and northern wet-mesic	T9N R21E Sec 16, 21, 20	#161 Solar Heights Lowlands	red-silver maple yellow birch	Brumm July 1977
Northern dry-mesic	T9N R22E Sec 33	#178 Donges Bay Gorge	white pine white birch red oak	Brumm July 1977
Northern dry-mesic	T9N R22E Sec 33	#179 Fairy Chasm Gorge	white pine white oak white cedar	Brumm July 1977
Southern mesic	T11N R21E Sec 11	#63 Riveredge Road Blueberry Road woodlot	sugar maple white ash beech	Brumm August 1977
Southern mesic	T11N R21E Sec 30	#82 UWM Woodlot	sugar maple ironwood white ash	Dunnum Summer 1971

			beech basswood	
Southern mesic	T10N R21E Sec 11	#111 Buckskin Bowman Woods	sugar maple beech	Levenson September 1975
Southern mesic	T10N R21E Sec 23	#116 Cedarburg Cedar Creek Forest	sugar maple beech white ash	Brumm August 1977
Southern mesic	T10N R21E Sec 1	#125 Kurz Woods	sugar maple beech	Levenson October 1975
Southern mesic	T9N R21E Sec 10	#151 MeeKwon Park Woods	sugar maple beech	Levenson August 1975
Southern mesic	T9N R21E	#163 Hwy 57 Green Bay Road Forest	sugar maple white ash beech	Levenson May 1976
Southern mesic	T9N R21E Sec 27	#175 Thiensville Forest	sugar maple beech white ash	Levenson July 1975
Southern dry-mesic to mesic	T12N R21E Sec 34	#34 Waubedonia Park Adjacent southern woodlot	sugar maple red oak beech	Brumm August 1976
Southern dry-mesic to mesic	T11N R21E Sec 3	#59 Blueberry Road Uplands	sugar maple red oak beech white ash	Brumm August 1976
Southern dry-mesic to mesic	T10N R22E Sec 20	#141 Falls Road Hwy W Forest	basswood red oak beech white oak	Brumm August 1977
Southern dry-mesic	T12N R21E Sec 19	#24 Riverside Road Upland Woods	red oak sugar maple white oak	Brumm June 1977

TABLE 2 — Species Composition of Ozaukee County Forest Stands As Indicated By
Importance Values. Trees per acre indicate stand density.

Site	Northern wet					Northern dry-mesic		Southern mesic	
	16	17	59	130	161	178	179	63	82
white pine		14.7				93.8	79.5		
white birch	5.5	4.8	20.9			36.2	27.9		
red oak						35.9	15.7	9.7	4.1
quaking aspen	5.5					11.3			
green ash		4.5		25.5		11.0	3.5		
white oak							35.4		
white cedar	40.4	59.0	84.0			27.3	35.3		
butternut					17.4		7.3		
black ash	85.4	42.9	72.8	90.8	17.2	3.6			
tamarack	79.4	45.9							
yellow birch	35.5	55.6	122.3	39.1	115.4				
red-silver maple	32.8	53.1		140.3	118.3				
black cherry		9.4			4.3			3.0	
bigtooth aspen		6.3						3.5	
sugar maple						16.6	11.4	116.6	121.8
white ash						19.2	10.0	57.2	35.8
beech						7.0	7.4	37.2	35.4
ironwood						6.9	8.0	15.4	39.0
basswood					4.1	23.9	29.3	28.0	29.8
yellowbud hickory						3.5		11.9	
shagbark hickory							3.5		17.7
black willow							15.5		
American elm		3.5							
cottonwood					11.8		10.5		
slippery elm	15.8				3.1				
Trees/acre	188.6	136.0	82.0	82.7	101.8	114.7	118.5	117.0	212.0

Site	Southern mesic						Southern dry-mesic			
	111	116	125	151	163	175	42	59	141	24
white pine										
white birch										
red oak	18.3			25.6	15.0	5.4	42.4	71.5	51.0	111.6
quaking aspen										
green ash										
white oak						4.8		5.8	42.4	38.0
white cedar							3.6	10.6		
butternut				3.9		2.1				
black ash								10.8	10.8	
tamarack										
yellow birch										
red-silver maple										
black cherry			9.6	28.5	15.7	15.7	3.3	11.4		
bigtooth aspen										
sugar maple	187.5	141.8	139.2	91.3	111.6	97.5	142.7	96.9	14.0	110.1
white ash	22.8	36.7	12.2	13.6	53.1	56.1	10.2	30.2	29.4	5.8
beech	82.5	83.8	118.5	86.8	50.2	66.6	53.0	42.6	47.0	
ironwood			2.5	5.1	12.0		23.9	7.4		4.9
basswood	7.2	10.6	17.8	30.2	20.9	27.1	11.5		82.9	18.4
yellowbud hickory						4.2	4.2	5.3		
shagbark hickory									22.2	11.8
black willow										
American elm		8.8		4.0	1.8	3.1				
cottonwood										
slippery elm				7.6	19.8	16.2				
Trees/acre	144.0	125.9	161.0	223.0	188.0	194.0	113.4	74.8	179.0	210.0

TABLE 3 Ozaukee County Forest Composition Based On Average Importance Values, 1833-5 and 1971-7.

Upland Forests ^{1,2}		
Major Species	1833-5	1971-7
Beech	113.0	58.6
Sugar Maple	49.1	114.3
Red-Black Oak	25.4	29.5
Basswood	20.1	23.7
White Oak	19.1	7.5
Elm	16.2	1.4
Black Ash	15.8	1.8
White Ash	9.4	30.3
Ironwood	6.8	9.1
White Birch	4.1	0.4
Lowland Forests ²		
Black ash	123.0	61.8
Tamarack	77.2	25.0
Elm	23.4	4.5
Cedar	26.0	36.7
White and Yellow Birch	28.1	79.8
Red-Silver Maple	15.4	68.9

(1) Northern dry-mesic omitted.

(2) Only major species included.